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A BOTANICAL TRIP TO THE HAWAIIAN ISLANDS. II.

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LANAI

A few days were spent on Lanai as a guest of Mr. George Munro, manager of the Lanai Ranch. Mr. Munro, an amateur botanist, familiar with the flora of the island, accompanied us on our trips and was of great service in bringing to our attention the rarer plants. The eastern part of the island runs up into a forested ridge, the highest point of which is about 3,500 feet (Fig. 31), the eastern slope steep and broken with precipitous gorges, the western slope gradually descending to a dry grassy plain. A species of prickly-pear cactus (*Opuntia megacantha* fide Dr. J. N. Rose) has become established here over wide areas and also on the dry regions of other islands (Fig. 32). *Paspalum dilatatum* is proving especially valuable as a pasture grass on the mountain slopes.

MAUI

Maui, the second largest island of the group, is divided into two mountainous masses with a low isthmus between, the two parts being known as East Maui and West Maui. Our investigations on West Maui were conducted from Lahaina on the west coast (Fig. 33). Through the courtesy of Mr. L. Weinsheimer, manager of the Lahaina Sugar Plantation, we were able to visit the highest peak, Puu Kukui, the summit of which is 5,788 feet. Mr. Munro accompanied us on this trip. We ascended the mountain as far as was possible with horses. The trail became so bad that the pack horses were mired and could go no further. The supplies were carried about half a mile further up, where camp was made, the horses being tied in the mire until the third day, when we returned. The tents were pitched in a small opening in the woods, but there had been so much rain that the ground was very soft and soon became mire all around the camp. The trunks of tree ferns were cut and placed in the paths to walk on. The tents were pitched in the rain and no fire was possible until the evening, when enough

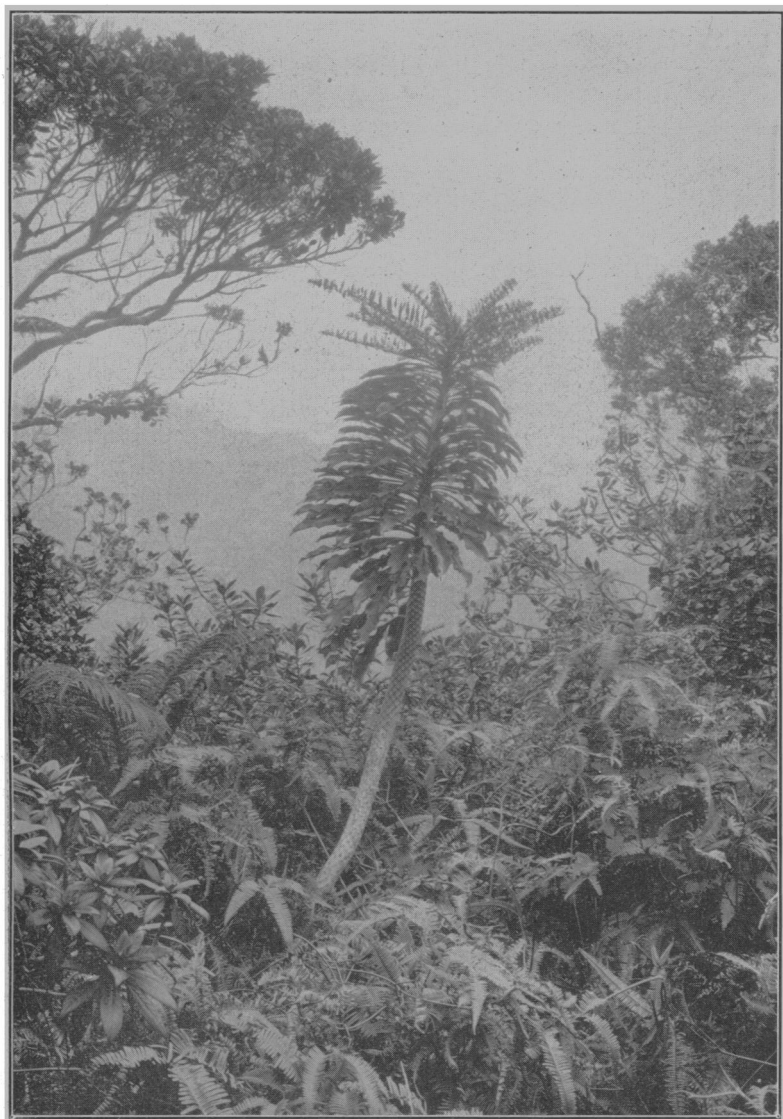


FIG. 31. LOBELIA IN HUMID FOREST NEAR SUMMIT OF MOUNTAINS, LANAI. A common climbing fern (*Gleichenia*) in foreground.

was made to prepare tea. The following day we made the ascent to the summit, returning to camp for the night. It rained nearly all the time and the trail was very wet and muddy. The most interesting feature of the vegetation is an open bog near the summit, a type which we found later on Molokai and Kauai. The bog is devoid of trees and large shrubs, though there are some small inconspicuous shrubs lying close to the surface (Fig. 34). Many plants form tussocks raised above the general surface. One of the most conspicuous of these is a sedge (*Oreobolus furcatus*). Three species of



FIG. 32. A CACTUS FOREST ON LANAI. The cattle have grazed off the lower branches.

Panicum are tussock-forming, *P. monticola*, *P. imbricatum* and *P. isachnoides*. These species are peculiar to the bogs. The most conspicuous plants were a species of *Lobelia* (*L. Gaudichaudii*) four to six feet high, with a pyramidal panicle two feet long of large showy cream-colored flowers, three to four inches long, and a species of *Wilkesia* (*W. Grayana*) similar in size of plant and inflorescence, with heads nearly an inch in diameter.

On East Maui is the famous Haleakala Crater said to be the largest crater in the world. Through the courtesy of Mr. Louis von Tempsky and Mr. S. A. Baldwin, of the Haleakala Ranch, we were able to spend four days in this crater. We remained one day at Idlewild near Olinda, on the north slope of Haleakala. Thanks to a pipe line, we were able to penetrate

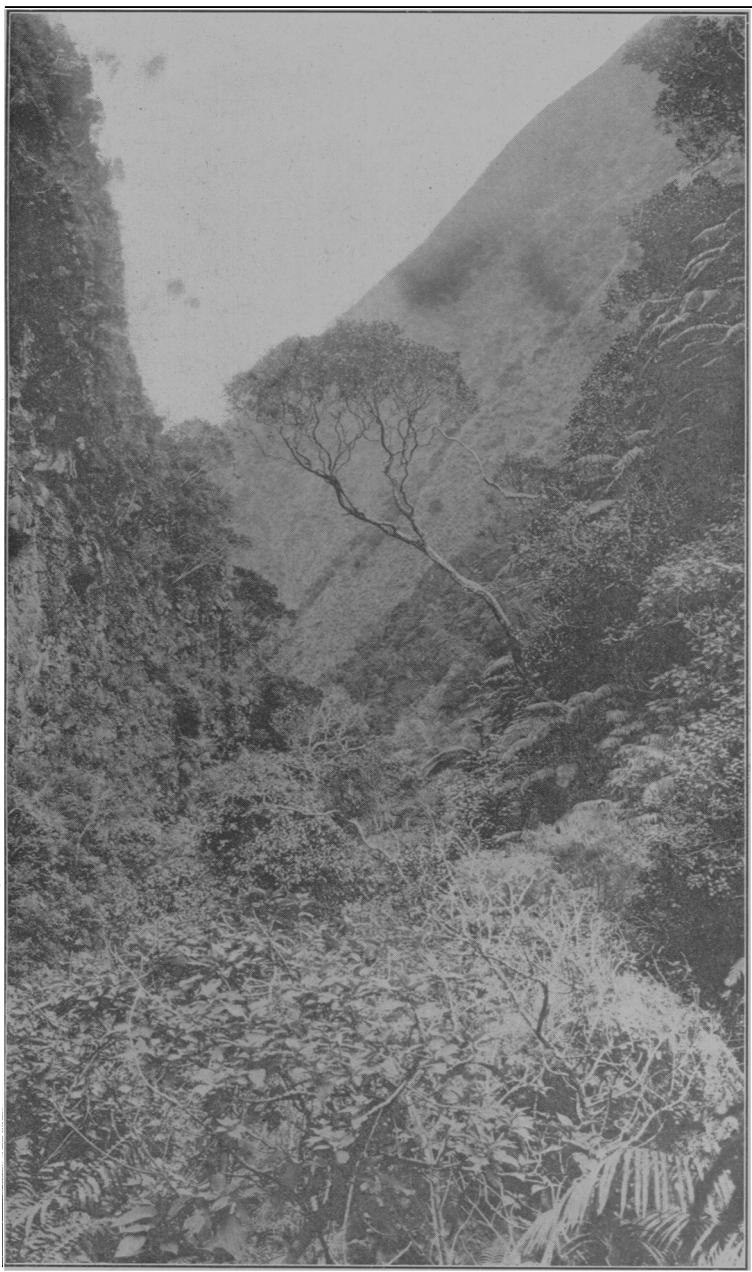


FIG. 33. A MOUNTAIN GORGE NEAR LAHAINA, showing the steepness of the valleys.



FIG. 34. A SMALL OPEN BOG NEAR KAHOLUAMANO, KAUAI. Forest in background.

the humid forest for four or five miles. One of the plants found on the slopes of the deep wet ravines of the islands is *Gunnera petaloidea*, with huge circular leaves three or four feet in diameter (Fig. 37).

We descended into the crater at White Hill, the rim here being about 10,000 feet altitude (Fig. 35). There is here a

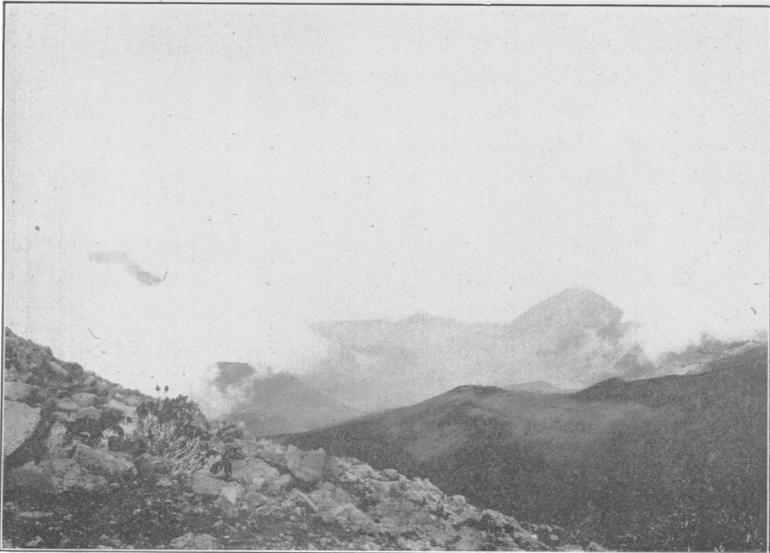


FIG. 35. HALEAKALA CRATER FROM WHITE HILL, the pass at the west margin (10,000 ft.). Clouds rolling in.

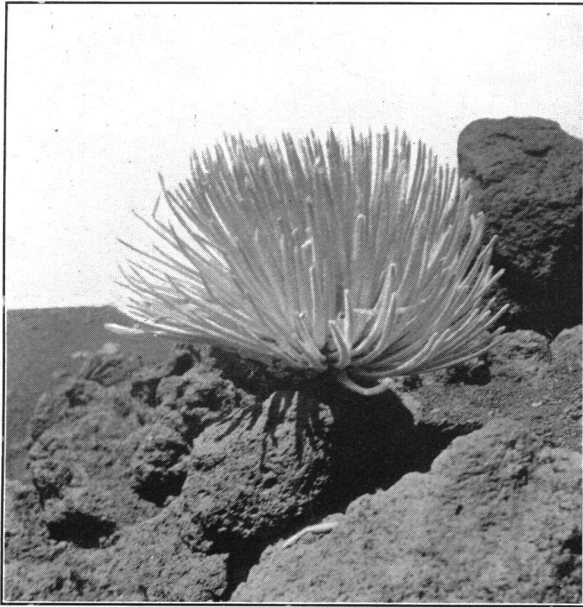


FIG. 36. SILVER-SWORD. A sterile plant brought from a cinder cone, supported in lava for photographing.

very fine view of the great crater, lying to the east, nineteen square miles in area, with many cinder cones within. One of the most interesting plants found here is the silver-sword (*Argyroxiphium sandwicense*), a member of the family Compositæ (Fig. 36). The narrow sword-like leaves, borne in dense hemispheric clusters, are covered with a silvery appressed tomentum that glistens in the sun. From the center of the cluster arises the flower-stalk bearing a large number of heads of flowers. The plants grow on the slopes of the cinder cones far above other vegetation and look at a distance like a flock of sheep. The silver-sword in a somewhat modified form grows on Mauna Kea and Mauna Loa but not in abundance. While climbing the western wall of the crater I had the misfortune to fall about fifty feet, escaping death by a very narrow margin.

MOLOKAI

This island lies with its greatest length east and west. The eastern half is mountainous (Fig. 38), the mountains ascending steeply but evenly on the south side, but dropping off very precipitously on the north side. The western half, more level and much drier, is occupied by the Molokai Ranch. The leper

settlement is on a peninsula on the north side of the island below the mountains. On the summit of the ridge is an open bog similar to the one on Puu Kukui.

KAUAI

Kauai, the Garden Island, the most northerly and the oldest geologically, is nearly circular in outline and rises somewhat uniformly to the central highest point, Waialeale, 5,170 feet altitude. The erosion on this island has been extensive, resulting in deep gorges and canyons. We visited Olokele Gulch (Figs. 39, 40), a very picturesque canyon a few miles from Waimea, but the main trip on the island was the ascent of Waialeale. This is a rather inaccessible peak and has been visited by few botanists, the first being the Austrian, Dr. Wawra. Professor Rock had ascended the mountain a few years previously and we were fortunate in having him with us



FIG. 37. A LEAF OF *Gunnera petaloidea*, brought down to Idlewild from the humid forest along the Olinda pipe line, Maui, near Haleakala.



FIG. 38. SOUTHERN MOLOKAI, NEAR MR. CONRADT'S PLACE, PUKOO. Looking up one of the steep valleys toward the central range.

on our trip. An account of the trip will be given somewhat in detail as it illustrates the difficulties of botanizing in wet regions.

We made our headquarters at Kaholuamano, a mountain house belonging to Mr. Francis Gay. The party consisted of Professor Rock, Albert and myself, and the Hawaiian guide Kualu, who has made the trip several times. We started from the mountain house in the forenoon, going with horses as far as the trail permitted, a distance of perhaps three miles. A Japanese helper took back the horses, but was to return to the same place on the third day to meet us. We then set out on foot, carrying our supplies on our back. We had food for three days, a meagre set of cooking utensils, blankets, extra change of clothing throughout, and a small camera.

The upper part of the mountain is very wet. A rain gauge is maintained on the summit which is read once a month. As much as 600 inches per annum have been recorded. Consequently the trail is very muddy and one often sinks to the knees, even when picking one's way. As the trail is traversed rarely except the monthly trips to the rain gauge it is not kept well cut out. About a mile of the trail is in the bed of a mountain stream. We were all wet through from head to foot as it was raining most of the time. The first night was spent in a cave (Keaku Cave) on the side of a very steep hill or cliff. The cave is an ancient one that was occupied by the natives on trips to get bird feathers for use in making royal robes. It is high up on the side of the cliff, perfectly dry, but without an approach save a steep path at one side and drops off suddenly at the front. The depth is only sufficient to give shelter to a few people lying down. In the cave we found a supply of white paper "inner sheets" left there by Professor Rock five years before. Fire wood is cut by each party occupying the cave and stored, so as to be dry for the use of the next party.

On the second day we started for the summit. A large open bog occupying several square miles stretches from the summit of Waialeale northwest along the plateau back of the main ridge, called the Wainiha Pali. This ridge is very steep on the northeast side, but gently sloping or almost level on the southwest side. The bog is about ten miles long and one or two miles wide. The plants are about the same species as are found in similar bogs on Molokai and West Maui. The bog extends to the summit, over which the cold wind blows with great violence. Here and there are pools and ponds. The cold wind blowing on our wet clothing chilled us thoroughly and we were glad to commence our return.

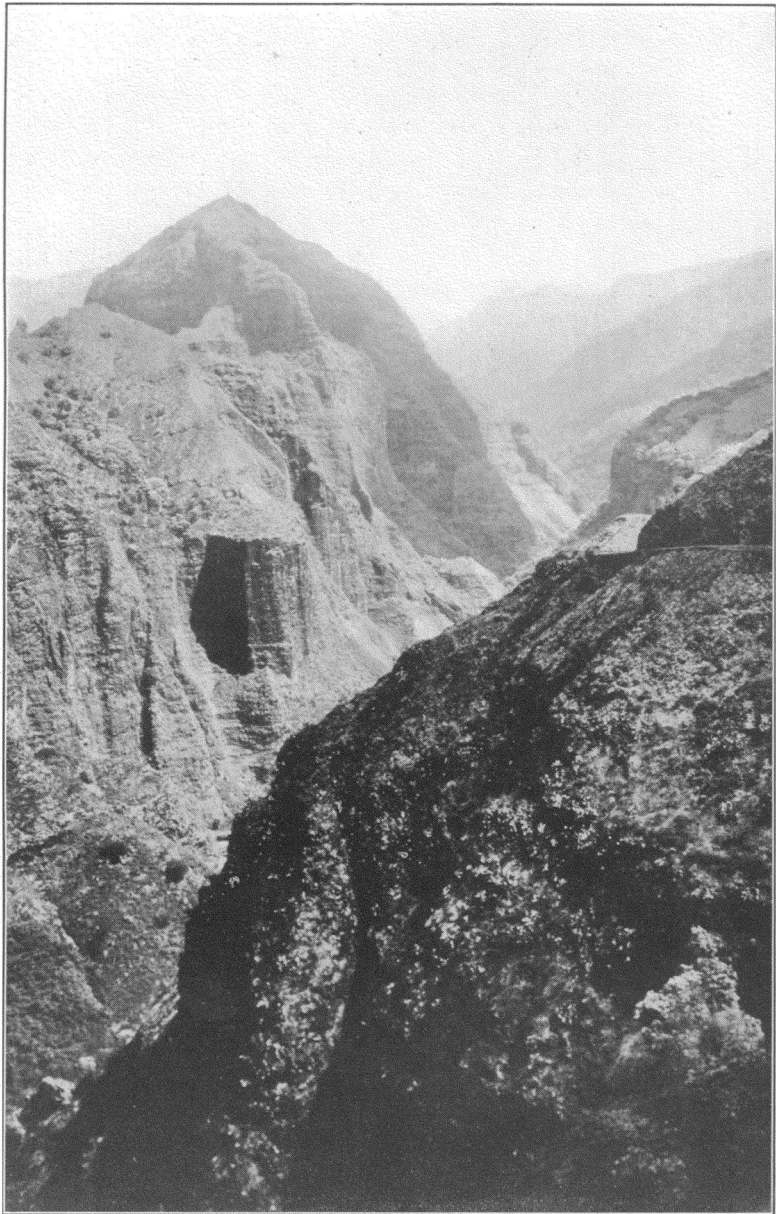


FIG. 39. OLOKELE GULCH, KAUAI, showing the effect of erosion.



FIG. 40. OLOKELE GULCH, KAUAI. The trees with light-colored foliage are Kukui (*Aleurites moluccana*).

The second night was spent at the cave and on the third day we reached Kaholuamano. The return was even more arduous than the outgoing trip. The load was heavier because of collections, which were not offset by the consumed provisions, and furthermore the rains had been heavy and continuous, so that the streams were higher and the trail more water-soaked.

A few days were spent at the mountain house, collecting in the vicinity. A very interesting species of *Poa* obtained on one of the ridges has been described by Professor Hackel as *Poa siphonoglossa*. It grows in large tufts on the steep slopes just below the top of the ridge. The numerous culms are several feet long, leafless, green, and have the appearance of a



FIG. 41. REPRESENTATIVES OF THE LOBELIA FAMILY; peculiar palm-like forms.

bullrush except they are lax and hang down the bank. The flowering culms are shorter and bear leaves to the summit. The spikelets and the flower culms look like those of *Poa*, but the rush-like sterile culms are different from any known species of that genus.

One of the interesting families of the Hawaiian flora is the Lobeliaceæ, represented by about 100 species belonging to 6 genera. The numerous arborescent species are very peculiar and characteristic. Many of them form slender trunks like small palms, crowned with a large cluster of long narrow

leaves (Figs. 41 and 42). The trunks of some species are as much as 30 or 40 feet high and the large bright-colored flowers are sometimes remarkably beautiful.

The ferns of the Hawaiian Islands are numerous in species and individuals. They are the dominant feature of all the wet forests. Three species of tree ferns (Fig. 43) of the genus *Cibotium* are found and in some places form extensive forests.



FIG. 42. AN ARBORESCENT SPECIES OF THE LOBELIA FAMILY (*Cyanea* sp.), a group highly developed in the Hawaiian Islands. Forests of central Kauai.



FIG. 43. TREE FERNS (*Cibotium Menziesii*) IN THE KOHALA MOUNTAINS. Those in the foreground are in a pasture and the surrounding vegetation has been kept down. In the background the ferns are mixed with other vegetation in a dense mass.

These produce at the base of the stipe a great ball of brownish-yellow wool called pulu by the natives and used by them for stuffing pillows and mattresses. One species (*C. Menziesii*) is shown in Fig. 43. Contrasted with the tree ferns are numerous small epiphytic forms, some species with fronds only an inch or two long. The ferns and fern allies number about 170 species.